

WHAT IS CLAIMED:

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1. A flexible printed circuit board comprising:
- a) a main body region orientated in a first direction having at least one electrical or optoelectronic device;
 - b) a plurality of electrical contact pads integrated into the main body region, where the electrical contact pads are capable of connecting the flexible printed circuit board to an external environment;
 - c) a buckle region extending from one end of the main body region; and
 - d) a head region extending from one end of the buckle region, and where the head region is orientated so that it is at an angle relative to the direction of the main body region.
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2. An apparatus as in claim 1, wherein the external environment is a second circuit board.
3. An apparatus as in claim 1, wherein at least one optoelectronic device comprises a photodetector.
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4. An apparatus as in claim 1, wherein at least one optoelectronic device comprises a vertical cavity surface emitting laser.
5. An apparatus as in claim 4, wherein the vertical cavity surface emitting laser comprises an oxide vertical cavity surface emitting laser.
6. An apparatus as in claim 1, further comprising at least one optoelectronic device adapted to the head region.
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7. An apparatus as in claim 6, wherein at least one optoelectronic device comprises a photodetector.
8. An apparatus as in claim 6, wherein at least one optoelectronic device comprises a vertical cavity surface emitting laser.
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9. An apparatus as in claim 8, wherein the vertical cavity surface emitting laser comprises an oxide vertical cavity surface emitting laser.
10. An apparatus as in claim 1, wherein the electrical contact pads are adapted to a first surface or a second surface of the main body region.

11. An apparatus as in claim 1, wherein the electrical contact pads are ball grid arrays.
12. An apparatus as in claim 1, wherein the electrical contact pads are solder balls.
13. An apparatus as in claim 1, wherein the electrical contact pads are land-grid arrays.

5 14. An apparatus as in claim 1, further comprising a spacer that is adapted to the head region of the flexible printed circuit board, wherein the spacer is capable of acting as a mounting surface for at least one optoelectronic device.

15. An apparatus as in claim 1, further comprising an optical power control system adapted to the head region of the flexible printed circuit board.

10 16. An apparatus as in claim 1, further comprising a driver or amplifier chip adapted to the head region or main body region of the flexible printed circuit board.

17. An apparatus as in claim 1, further comprising a plurality of conducting lines that are adapted to the head region, the buckle region and the main body region.

18. A flexible printed circuit board comprising:

- a) a main body region orientated in a first direction having at least one electrical or optoelectronic device;
- b) a buckle region extending from one end of the main body region;
- c) a head region extending from one end of the buckle region, and where the head region is orientated so that it is at an angle relative to the direction of the main body region; and
- d) a heat spreader adapted along at least a portion of a surface of the head region of the flexible printed circuit board.

19. An apparatus as in claim 18, wherein at least one optoelectronic device comprises a photodetector.

20. An apparatus as in claim 18, wherein at least one optoelectronic device comprises a vertical cavity surface emitting laser.

21. An apparatus as in claim 20, wherein the vertical cavity surface emitting laser comprises an oxide vertical cavity surface emitting laser.

1. *Staphylinidae* (100%)
 2. *Curculionidae* (100%)
 3. *Chrysomelidae* (100%)
 4. *Scarabaeidae* (100%)
 5. *Elmidae* (100%)
 6. *Longhorn* (100%)
 7. *Beetle* (100%)
 8. *Ant* (100%)
 9. *Termite* (100%)
 10. *Spider* (100%)
 11. *Scorpion* (100%)
 12. *Centipede* (100%)
 13. *Millipede* (100%)
 14. *Cricket* (100%)
 15. *Flea* (100%)
 16. *Tick* (100%)
 17. *Wasp* (100%)
 18. *Bee* (100%)
 19. *Butterfly* (100%)
 20. *Moth* (100%)
 21. *Caterpillar* (100%)
 22. *Grasshopper* (100%)
 23. *Frog* (100%)
 24. *Toad* (100%)
 25. *Salamander* (100%)
 26. *Snake* (100%)
 27. *Lizard* (100%)
 28. *Turtle* (100%)
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 94. *Turtle* (100%)
 95. *Snake* (100%)
 96. *Lizard* (100%)
 97. *Turtle* (100%)
 98. *Snake* (100%)
 99. *Lizard* (100%)
 100. *Turtle* (100%)

22. An apparatus as in claim 18, further comprising at least one optoelectronic device adapted to the head region.
23. An apparatus as in claim 22, wherein at least one optoelectronic device comprises a photodetector.
24. An apparatus as in claim 22, wherein at least one optoelectronic device comprises a vertical cavity surface emitting laser.
25. An apparatus as in claim 24, wherein the vertical cavity surface emitting laser comprises an oxide vertical cavity surface emitting laser.
26. An apparatus as in claim 18, wherein the head region is orientated in such a manner so that it is substantially perpendicular to the direction of the main body region.
27. An apparatus as in claim 18, further comprising at least one opening in the head region, the opening capable of providing thermal access to the heat spreader.
28. An apparatus as in 27, wherein the opening comprises a thermal via, the thermal via capable of transmitting heat from the flexible printed circuit board to the heat spreader.
29. An apparatus as in 27, wherein the opening comprises a heat pipe, the heat pipe capable of transmitting heat from the flexible printed circuit board to the heat spreader.
30. An apparatus as in claim 18, wherein the heat spreader provides mechanical rigidity or stiffness to the head region.
31. An apparatus as in claim 18, further comprising wire leads adapted to the main body region.
32. An apparatus as in claim 18, further comprising electrical contact pads integrated into the main body region, wherein the electrical contact pads capable of connecting the flexible printed circuit board to an external environment.
33. An apparatus as in claim 32, wherein the external environment comprises a circuit board.
34. An apparatus as in claim 32, wherein the electrical contact pads are adapted to a first surface or a second surface of the main body region.
35. An apparatus as in claim 32, wherein the electrical contact pads are ball grid arrays.

36. An apparatus as in claim 32, wherein the electrical contact pads are solder balls.
37. An apparatus as in claim 32, wherein the electrical contact pads are land-grid arrays.
38. A flexible printed circuit board comprising:
- a) a main body region orientated in a first direction having at least one electrical or optoelectronic component;
 - b) a buckle region extending from one end of the main body region; and
 - c) a head region extending from one end of the buckle region, and where the head region is orientated so that it is at an angle relative to the direction of the main body region;
 - d) an electrical plane adapted along at least a portion of a surface of the head region of the flexible printed circuit board.
39. An apparatus as in claim 38, wherein the electrical plane is also an electrical contact and ground plane.
40. An apparatus as in claim 38, wherein at least one optoelectronic device comprises a photodetector.
41. An apparatus as in claim 38, wherein at least one optoelectronic device comprises a vertical cavity surface emitting laser.
42. An apparatus as in claim 41, wherein the vertical cavity surface emitting laser comprises an oxide vertical cavity surface emitting laser.
43. An apparatus as in claim 38, further comprising at least one optoelectronic device adapted to the head region.
44. An apparatus as in claim 43, wherein at least one optoelectronic device comprises a photodetector.
45. An apparatus as in claim 43, wherein at least one optoelectronic device comprises a vertical cavity surface emitting laser.
46. An apparatus as in claim 45, wherein the vertical cavity surface emitting laser comprises an oxide vertical cavity surface emitting laser.

47. An apparatus as in claim 38, wherein the head region is orientated in such a manner so that it is substantially perpendicular to the direction of the main body region.

48. An apparatus as in claim 38, wherein the electrical plane is capable of functioning as an electrical contact path to at least one electrical or optoelectronic component on the head region.

49. An apparatus as in claim 38, wherein the electrical plane is capable of limiting electromagnetic interference to at least one electrical or optoelectronic component on the head region.

50. An apparatus as in claim 38, wherein the electrical plane provides mechanical rigidity or stiffness to the head region.

51. An apparatus as in claim 38, further comprising wire leads adapted to the main body region.

52. An apparatus as in claim 38, further comprising electrical contact pads integrated into the main body region, wherein the electrical contact pads are capable of connecting the flexible printed circuit board to an external environment.

53. An apparatus as in claim 52, wherein the external environment comprises a circuit board.

54. An apparatus as in claim 52, wherein the electrical contact pads are adapted to a first surface or a second surface of the main body region.

55. An apparatus as in claim 52, wherein the electrical contact pads are ball grid arrays.

56. An apparatus as in claim 52, wherein the electrical contact pads are solder balls.

57. An apparatus as in claim 52, wherein the electrical contact pads are land-grid arrays.

58. A flexible printed circuit board comprising:

- a) a main body region orientated in a first direction having at least one electrical or optoelectronic component;
- b) a buckle region extending from one end of the main body region;
- c) a head region extending from one end of the buckle region, and where the head region is orientated so that it is at an angle relative to the direction of the main body region; and

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d) a height adjuster adapted along at least a portion of a surface of the head region of the flexible printed circuit board.

59. An apparatus as in claim 58, wherein at least one optoelectronic device comprises a photodetector.

60. An apparatus as in claim 58, wherein at least one optoelectronic device comprises a vertical cavity surface emitting laser.

61. An apparatus as in claim 60, wherein the vertical cavity surface emitting laser comprises an oxide vertical cavity surface emitting laser.

10 18/62. An apparatus as in claim 58, further comprising at least one optoelectronic device adapted to the head region.

14/63. An apparatus as in claim 62, wherein at least one optoelectronic device comprises a photodetector.

20/64. An apparatus as in claim 62, wherein at least one optoelectronic device comprises a vertical cavity surface emitting laser.

21/65. An apparatus as in claim 64, wherein the vertical cavity surface emitting laser comprises an oxide vertical cavity surface emitting laser.

22/66. An apparatus as in claim 58, wherein the head region is orientated in such a manner so that it is substantially perpendicular to the direction of the main body region.

23/67. An apparatus as in claim 58, wherein the height adjuster is capable of changing the height of at least one electrical or optoelectronic component on the head region.

24/68. An apparatus as in claim 58, further comprising wire leads adapted to the main body region.

25/69. An apparatus as in claim 58, further comprising electrical contact pads integrated into the main body region, wherein the electrical contact pads are capable of connecting the flexible printed circuit board to an external environment.

26/70. An apparatus as in claim 69, wherein the external environment comprises a circuit board.

27/71. An apparatus as in claim 69, wherein the electrical contact pads are adapted to a first surface or a second surface of the main body region.

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An apparatus as in claim 69, wherein the electrical contact pads are ball grid arrays.

29/
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An apparatus as in claim 69, wherein the electrical contact pads are solder balls.

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24.

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An apparatus as in claim 69, wherein the electrical contact pads are land-grid arrays.

75. A flexible printed circuit board comprising:

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- a) a main body region orientated in a first direction having at least one electrical or optoelectronic component;
 - b) a buckle region extending from one end of the main body region;
 - c) a head region extending from one end of the buckle region, and where the head region is orientated so that it is at an angle relative to the direction of the main body region;
 - d) a heat spreader adapted along at least a portion of a surface of the head region of the flexible printed circuit board; and
 - e) a window in the head region of the flexible printed circuit board, the window capable of providing access to the heat spreader.
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15 76. An apparatus as in claim 75, wherein at least one optoelectronic device comprises a photodetector.

77. An apparatus as in claim 75, wherein at least one optoelectronic device comprises a vertical cavity surface emitting laser.

20 78. An apparatus as in claim 77, wherein the vertical cavity surface emitting laser comprises an oxide vertical cavity surface emitting laser.

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An apparatus as in claim 75, further comprising at least one optoelectronic device adapted to the heat spreader in such a manner that at least one optoelectronic device is accessible through the window in the flexible printed circuit board.

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An apparatus as in claim 79, wherein at least one optoelectronic device comprises a photodetector.

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An apparatus as in claim 79, wherein at least one optoelectronic device comprises a vertical cavity surface emitting laser.

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³⁴
An apparatus as in claim ~~81~~³⁴, wherein the vertical cavity surface emitting laser comprises an oxide vertical cavity surface emitting laser.

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An apparatus as in claim ~~75~~³¹, wherein the heat spreader provides mechanical rigidity or stiffness to the head region of the flexible printed circuit board.

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³¹
An apparatus as in claim ~~75~~³¹, wherein the head region is orientated in such a manner so that it is substantially perpendicular to the direction of the main body region.

85. An apparatus as in claim ~~75~~³¹, further comprising an optical power control system adapted to the head region of the flexible printed circuit board.

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An apparatus as in claim ~~75~~³¹, further comprising a driver or amplifier chip adapted to the head region or main body region of the flexible printed circuit board.

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An apparatus as in claim ~~75~~³¹, further comprising a plurality of conducting lines that are adapted to the head region, the buckle region and the main body region.

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An apparatus as in claim ~~75~~³¹, further comprising wire leads adapted to the main body region.

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An apparatus as in claim ~~75~~³¹, further comprising electrical contact pads integrated into the main body region, wherein the electrical contact pads capable of connecting the flexible printed circuit board to an external environment.

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An apparatus as in claim ~~89~~⁴¹, wherein the external environment comprises a circuit board.

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An apparatus as in claim ~~89~~⁴¹, wherein the electrical contact pads are adapted to a first surface or a second surface of the main body region.

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An apparatus as in claim ~~89~~⁴¹, wherein the electrical contact pads are ball grid arrays.

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⁴¹
An apparatus as in claim ~~89~~⁴¹, wherein the electrical contact pads are solder balls.

~~46~~
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⁴¹
An apparatus as in claim ~~89~~⁴¹, wherein the electrical contact pads are land-grid arrays.

25 95. A flexible printed circuit board comprising:

- Sub 44*
- a) a main body region orientated in a first direction having at least one electrical or optoelectronic component;
 - b) a buckle region extending from one end of the main body region;

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- c) a head region extending from one end of the buckle region, and where the head region is orientated so that it is at an angle relative to the direction of the main body region;
- d) a height adjuster adapted along at least a portion of a surface of the head region of the flexible printed circuit board; and
- e) a window in the head region of the flexible printed circuit board, the window capable of providing access to the height adjuster.

96. An apparatus as in claim 95, wherein at least one optoelectronic device comprises a photodetector.

97. An apparatus as in claim 95, wherein at least one optoelectronic device comprises a vertical cavity surface emitting laser.

98. An apparatus as in claim 97, wherein the vertical cavity surface emitting laser comprises an oxide vertical cavity surface emitting laser.

99. An apparatus as in claim 95, further comprising at least one optoelectronic device adapted to the height adjuster in such a manner that at least one optoelectronic device is accessible through the window in the flexible printed circuit board.

100. An apparatus as in claim 99, wherein at least one optoelectronic device comprises a photodetector.

101. An apparatus as in claim 99, wherein at least one optoelectronic device comprises a vertical cavity surface emitting laser.

102. An apparatus as in claim 101, wherein the vertical cavity surface emitting laser comprises an oxide vertical cavity surface emitting laser.

103. An apparatus as in claim 95, wherein the height adjuster provides mechanical rigidity or stiffness to the head region of the flexible printed circuit board.

104. An apparatus as in claim 95, wherein the head region is orientated in such a manner so that it is substantially perpendicular to the direction of the main body region.

105. An apparatus as in claim 95, further comprising an optical power control system adapted to the head region of the flexible printed circuit board.

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An apparatus as in claim 95, further comprising a driver or amplifier chip adapted to the head region or main body region of the flexible printed circuit board.

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An apparatus as in claim 95, further comprising a plurality of conducting lines that are adapted to the head region, the buckle region and the main body region.

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An apparatus as in claim 95, further comprising wire leads adapted to the main body region.

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An apparatus as in claim 95, further comprising electrical contact pads integrated into the main body region, wherein the electrical contact pads capable of connecting the flexible printed circuit board to an external environment.

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An apparatus as in claim 109, wherein the external environment comprises a second circuit board.

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An apparatus as in claim 109, wherein the electrical contact pads are adapted to a first surface or a second surface of the main body region.

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An apparatus as in claim 109, wherein the electrical contact pads are ball grid arrays.

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An apparatus as in claim 109, wherein the electrical contact pads are solder balls.

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114.

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An apparatus as in claim 109, wherein the electrical contact pads are land-grid arrays.

115.

~~A flexible printed circuit board comprising:~~

- a) a main body region orientated in a first direction having at least one electrical or optoelectronic component;
- b) a buckle region extending from one end of the main body region;
- c) a head region extending from one end of the buckle region, and where the head region is orientated so that it is at an angle relative to the direction of the main body region;
- d) an electrical plane adapted along at least a portion of a surface of the head region of the flexible printed circuit board; and
- e) a window in the head region of the flexible printed circuit board, the window capable of providing access to the electrical plane.

116. An apparatus as in claim 115, wherein at least one optoelectronic device comprises a photodetector.
117. An apparatus as in claim 115, wherein at least one optoelectronic device comprises a vertical cavity surface emitting laser.
- 5 118. An apparatus as in claim 117, wherein the vertical cavity surface emitting laser comprises an oxide vertical cavity surface emitting laser.
119. An apparatus as in claim 115, further comprising at least one optoelectronic device adapted to the electrical plane in such a manner that at least one optoelectronic device is accessible through the window in the flexible printed circuit board.
- 10 120. An apparatus as in claim 119, wherein at least one optoelectronic device comprises a photodetector.
121. An apparatus as in claim 119, wherein at least one optoelectronic device comprises a vertical cavity surface emitting laser.
122. An apparatus as in claim 121, wherein the vertical cavity surface emitting laser comprises an oxide vertical cavity surface emitting laser.
123. An apparatus as in claim 115, wherein the electrical plane further comprises an electrical contact and ground plane.
124. An apparatus as in claim 115, wherein the electrical plane capable of limiting electromagnetic interference to at least one electrical or optoelectronic component on the head region.
- 20 125. An apparatus as in claim 115, wherein the electrical plane capable of acting as an electrical contact path to at least one electrical or optoelectronic component on the head region of the mounting surface or to the external environment.
126. An apparatus as in claim 115, wherein the electrical plane provides mechanical rigidity or stiffness to the head region of the mounting surface.
- 25 127. An apparatus as in claim 115, wherein the head region is orientated in such a manner so that it is substantially perpendicular to the direction of the main body region.
128. An apparatus as in claim 115, further comprising an optical power control system adapted to the head region of the flexible printed circuit board.

129. An apparatus as in claim 115, further comprising a driver or amplifier chip adapted to the head region or main body region of the flexible printed circuit board.

130. An apparatus as in claim 115, further comprising a plurality of conducting lines that are adapted to the head region, the buckle region and the main body region.

5 131. An apparatus as in claim 115, further comprising wire leads adapted to the main body region.

132. An apparatus as in claim 115, further comprising electrical contact pads integrated into the main body region, wherein the electrical contact pads capable of connecting the flexible printed circuit board to an external environment.

10 133. An apparatus as in claim 132, wherein the external environment comprises a circuit board.

134. An apparatus as in claim 132, wherein the electrical contact pads are adapted to a first surface or a second surface of the main body region.

135. An apparatus as in claim 132, wherein the electrical contact pads are ball grid arrays.

136. An apparatus as in claim 132, wherein the electrical contact pads are solder balls.

137. An apparatus as in claim 132, wherein the electrical contact pads are land-grid arrays.

138. A flexible printed circuit board comprising:

a) a substantially rectangular main body region with two short sides and two long sides, the main body region having at least one electrical or optoelectronic device adapted thereto;

b) a buckle region extending from one of the short sides of the main body region;

c) a head region extending from the buckle region in a planar orientation substantially perpendicular to the main body region; and

d) a head region having at least one optoelectronic device thereon, the optoelectronic device situated substantially along a longitudinal axis of the flexible printed circuit board.

65 139. An apparatus as in claim 138, wherein at least one optoelectronic device comprises a photodetector.

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140. An apparatus as in claim 138, wherein at least one optoelectronic device comprises a vertical cavity surface emitting laser.

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141. An apparatus as in claim 140, wherein the vertical cavity surface emitting laser comprises an oxide vertical cavity surface emitting laser.

5 142. An apparatus as in claim 119, further comprising at least one electrical or optoelectrical device adapted to a surface of the main body region.

143. An apparatus as in claim 142, wherein at least one optoelectronic device comprises a photodetector.

10 144. An apparatus as in claim 142, wherein at least one optoelectronic device comprises a vertical cavity surface emitting laser.

145. An apparatus as in claim 144, wherein the vertical cavity surface emitting laser comprises an oxide vertical cavity surface emitting laser.

146. An apparatus as in claim 138, further comprising a spacer that is adapted the head region of the flexible printed circuit board, wherein the spacer capable of functioning as a mounting surface for the optoelectronic devices.

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147. An apparatus as in claim 138, further comprising an optical power control system adapted to the flexible printed circuit board.

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148. An apparatus as in claim 138, further comprising a driver or amplifier chip adapted to the head region or the main body region of the flexible printed circuit board.

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149. An apparatus as in claim 138, further comprising a plurality of conducting lines that are adapted to the head region, the buckle region and the main body region.

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150. An apparatus as in claim 138, further comprising wire leads adapted to the main body region.